

Opto 22 Application Note

AN9809

PC ARCNET Card Installation for Use With FactoryFloor

Introduction

This application note is a compilation of years of experience and testing. It is intended to help users properly set up and configure either a coaxial or fiber optic ARCNET card for use with FactoryFloor. This only applies to memory-mapped ARCNET cards. This is not intended for use with PCI ARCNET cards, I/O-mapped ARCNET cards, PCMCIA ARCNET adapters, or the Opto 22 AC47 adapter card.

You can download the ARCTest Programs, ARCIO.BAS and ARCMEM.BAS, as well as the QBASIC compiler from the [Software Upgrades](#) page.

Setup and Test

Prerequisites and Precautions:

1. The ARCNET card must not be installed in the computer prior to step 4, otherwise Steps 1 through 3 will rule out the I/O address that the card is set for.
2. It is best to use only the PCA66 series ARCNET cards from Contemporary Controls. This will rule out potential problems that have been seen with other brands and models of ARCNET cards. The PCA66-CXS is for coaxial, star topology, ARCNET systems. Do not use the PCA66-CXB as this card is for ARCNET bus topology systems. The PCA66-FOG-ST is for fiber optic ARCNET systems. Contact Contemporary Controls at (630) 963-7070 or go to www.ccontrol.com.
3. Do not use I/O addresses 2E0, 2F0, or 3E0 because of potential conflicts with standard Windows COM ports. These conflicts may cause intermittent problems that may go unnoticed.
4. Under no circumstances should networking drivers be installed for the ARCNET card via the operating system. This will make the card unusable by FactoryFloor.
5. The current FactoryFloor drivers do not use interrupts. Therefore, it is best to remove the interrupt jumper from the ARCNET card because it may cause conflicts with other devices in the computer.

Procedure:

1. On Windows NT, check Windows NT Diagnostics (Resources tab) to identify which I/O port and memory addresses are already listed as used. On Windows 95 check Device Manager. All other values are POTENTIAL candidates.
2. Run the QBASIC program ARCIO.BAS. This will read each of the 16 bytes at each I/O port candidate address. Any values that are on the POTENTIAL candidate list that return the value FF for all 16 bytes of the I/O port range remain candidates. All others are eliminated. If errors like "could not open COM2 requested by application" occur, select the "Ignore" button, and rule out that setting. Stay away from 2E0, 2F0, and 3E0 because of potential conflicts with standard Windows COM ports. Testing indicates that all of the addresses still on the POTENTIAL list will work with the Contemporary Controls PCA66 series cards as well as the Compex cards (obsolete). SOME of the addresses may work with the Contemporary Controls PCX-CXS card and the SMC PC130 or PC130E cards. By far, the best bet is to stick with the PCA66 series.
3. Run the QBASIC program ARCMEM.BAS. This will attempt to write the value CC to each byte of the

memory sector being tested and then read the byte that was just written to. With Windows NT, any values that are on the POTENTIAL candidate list that return CC for all 2,048 bytes of the RAM address range remain candidates. All others are eliminated. With Windows 95, any values that are on the POTENTIAL candidate list that return FF for all 2,048 bytes of the RAM address range remain candidates. All others are eliminated. In other words, for Windows 95, if the reads match the data that was written, then the RAM address is already mapped to another device. These RAM addresses are ruled out. Testing indicates that memory addresses C0000 and C4000 are typically eliminated by this test. In addition, testing indicates that for some reason, one of the remaining potential addresses may not work.

4. Pick I/O port and RAM addresses from the remaining potential choices and set up the ARCNET card. Install the ARCNET card, but do not configure the port with FactoryFloor. Keep in mind that the most common setup problem is caused by incorrect jumper settings. Pay very close attention to the ARCNET card user's guide with respect to jumpers.
5. Run the ARCMEM.BAS utility again to write to and read from the RAM addresses for the entire 2 kB segment. If all of the reads for a segment being tested match the data that was written (CC), then the RAM address should work.
6. Configure a controller and the corresponding ARCNET port with FactoryFloor.
7. (Windows NT only): Reboot.
8. Using OptoTerm, select the controller and View/Status. The Status Window should show valid data. If not, then an error will occur, and the current settings may not work. However, it is more likely that the error has a different cause. See the sections titled **Errors** and **ARCNET Troubleshooting Tips**.
9. Using OptoTerm, select the controller and View/Words. Monitor the ARCNET LED on the controller during this test. If the ARCNET LED stays on solid during the test, then the ARCNET card settings are good. If the ARCNET LED turns on and off intermittently during the test (for example, 2 seconds on alternating with 2 seconds off), then the RAM address is not a good match. Select a different RAM address from the remaining potential choices and start over at step 4 of this procedure.

Errors

- Use OptoPort to verify that the registry matches the FactoryFloor port settings. OptoPort is packaged with OptoUtilities which comes with OptoControl and FactoryFloor. OptoUtilities can also be downloaded from the [Software Upgrades](#) section of this site. An OptoPassword will be necessary in order to install OptoUtilities: for information on obtaining an OptoPassword for this application, click [here](#).

What different errors occur and under what conditions?

-29 = Time-out error:

FactoryFloor did not receive a response within the period set by the time-out parameter.

The time-out parameter (in FactoryFloor Port Setup) may be set too short. Start with a value of 2,000 msec.

The controller may not have responded due to the wrong address setting. The controller address in FactoryFloor may not match the controller's address.

The controller may not have received the message at all. The ARCNET cable or connections may be bad.

Sometimes this error will occur even if there is no ARCNET card installed in the computer at that I/O address.

-33 = Send error:

ARCNET could not send the command.

This may occur if there are multiple nodes on the network with the same node ID. Remember, each ARCNET card and each Mystic controller on the ARCNET network must have a unique ID. The Mystic controller's ARCNET node ID is the same as the controller's address.

-102 = Port Setup failed:

This may occur if the port was just setup in Windows NT and an attempt was made to use it before rebooting. With Windows NT, reboot after each and every port change (even if FactoryFloor does not prompt for a reboot).

The correct version of WIN RT (as installed by FactoryFloor) must be used or this error may result (regardless of card settings). Contact Opto 22 Product Support for more information about the correct version of WIN RT.

-127 = Win RT failed to start:

On Windows NT, make sure the file WINRT.SYS is in the \<windows>\system32\drivers\ directory.

Make sure the WINRT.SYS file is the one installed by FactoryFloor and not a version that may have been installed by another software package. Contact Opto 22 Product Support for more information about the correct version of this file.

After making changes with the WINRT.SYS file, reboot the computer.

Other errors:

Windows NT (on boot up) will report a boot start system failed to start (Win RT) if an ARCNET port has not been set up in FactoryFloor. This is simply an indication. This will be corrected in Step 6 of the Setup and Test procedure.

ARCNET Troubleshooting Tips and Common Problems:

1. The most common problem with initially setting up an ARCNET card and getting it to work properly is incorrect jumper settings.
2. Another common problem is the misconception that the card needs to be setup in the operating system as a network adapter. Do NOT do this.
3. With Windows NT, make sure you reboot after configuring the card/port in FactoryFloor.
4. Check for available I/O port and memory address settings prior to physically installing the card and prior to configuring the card in FactoryFloor. This can be done by checking the Device Manager in Windows 95 or Windows NT Diagnostics (Resources Tab) in Windows NT.
5. Review ARCNET card LED activity for clues. See the ARCNET card user's guide for more information about what the LEDs indicate.

6. Each node on the ARCNET network must have a unique node ID. For a Mystic controller, the node ID is synonymous with the controller's address.
7. Do not use ARCNET node ID 0 (zero).
8. If using an M4 type of Mystic controller, try to seat the card more fully. Sometimes it needs to be pushed into the M4 bus slot another 1/8th of an inch.
9. Ensure the ARCNET network is cabled with star topology. Bus topology is not supported.
10. Ensure the ARCNET adapter being used in the computer supports star topology and is set up for star topology.
11. Use OptoPort to verify the card is actually set up in the registry properly.
12. Windows NT (on boot up) will report a boot start system failed to start (Win RT) if an ARCNET port has not been set up in FactoryFloor. This is simply an indication. This will be corrected in Step 6 of the Setup and Test procedure.
13. When troubleshooting, try using a direct connection between the computer and the controller with a cable that is less than 100 feet. If longer distances are required, use an active hub. Use only the Mod Hub series of active hubs by Contemporary Controls (especially in industrial environments).
14. Use only RG 62 (93 ohm) cable. Do not use RG 58 (50 ohm) Ethernet cable.
15. If using a passive hub, ensure that any unused ports are properly terminated with 93 ohm terminators. Use passive hubs only with very short cable runs.

CCSI Testing with PCX-CXS

<u>I/O</u>	<u>RAM</u>	<u>Result of OptoTerm View/Words Test (Upload data from controller)</u>
2E0	D0000	intermittent/slow (the controller's ARCNET LED was on intermittently)
2E0	CC000	OK (the controller's ARCNET LED was on constant until done)
3E0	D0000	OK (the controller's ARCNET LED was on constant until done)
3E0	CC000	OK (the controller's ARCNET LED was on constant until done)

Using Windows 95 (a) the PCX-CXS worked intermittently at 2E0 D0000. The test uploaded information from an Opto 22 controller. It took exceptionally long and the ARCNET LED on the controller alternately turned on and off (about 2 seconds each which matched the port timeout which was set for 2,000 msec). Eventually, all of the data was received correctly. The PCA66-CXS worked fine at 2E0 D0000. This indicates there is something different between these 2 cards that contributes to this problem. Prior to installing the cards, the Windows 95 Device Manager indicated that 2E0 through 2EF was unused/available.

I/O Addressing:

- The ARCNET card occupies 16 bytes starting at the base I/O address set using jumpers on the ARCNET card. 15 (decimal) = F (hex) and 16 (decimal) = 10 (hex). 00-15 (decimal) accounts for 16 addresses and corresponds to 0-F (hex). For example:
 - 260 uses 260 - 26F
 - 290 uses 290 - 29F
 - 2E0 uses 2E0 - 2EF Conflicts with Windows COM4 (COM4=2E8-2EF)
 - 2F0 uses 2F0 - 2FF Conflicts with Windows COM2 (COM2=2F8-2FF)
 - 300 uses 300 - 30F
 - 350 uses 350 - 35F
 - 380 uses 380 - 38F
 - 3E0 uses 3E0 - 3EF Conflicts with Windows COM3 (COM3=3E8-3EF)
 - There should not be any conflicts with "Opto" COM3 (348-34F) and "Opto" COM4 (340-347).

COM Port Notes:

- Windows COM1 = 3F8-3FF
- Windows COM2 = 2F8-2FF Conflicts with 2F0
- Windows COM3 = 3E8-3EF Conflicts with 3E0
- Windows COM4 = 2E8-2EF Conflicts with 2E0
- "Opto 22" COM3 = 348-34F
- "Opto 22" COM4 = 340-347

RAM Addressing:

- The ARCNET card uses 2 kB of memory starting at the base RAM address set using jumpers on the ARCNET card. 2 kB = 2,048 (decimal). 0-2,047 (decimal) accounts for 2,048 addresses and corresponds to 000-7FF (hex). For example:
 - C0000 uses C0000 - C07FF In use on every computer tested. Possibly video conflicts. Windows NT diagnostics showed this memory range as being unused/available.
 - C4000 uses C4000 - C47FF In use on every computer tested. Possibly video conflicts. Windows NT diagnostics showed this memory range as being unused/available.
 - CC000 uses CC000 - CC7FF
 - D0000 uses D0000 - D07FF
 - D4000 uses D4000 - D47FF
 - D8000 uses D8000 - D87FF
 - DC000 uses DC000 - DC7FF
 - E0000 uses E0000 - E07FF "Unused" but not functional on all but one computer tested. Possibly video conflicts. Windows NT diagnostics showed this memory range as being unused/available.

Unresolved Questions:

- Why don't C0000, C4000, and E0000 work even though Windows NT Diagnostics show them as being available?
- Why do C0000 and C4000 show "garbage" and E0000 shows "FF"s but none of them work?